

REMARKS

Examiner's comments have been read with care to more fully understand Examiner's position. We have accordingly looked carefully for differences in the compositions of the invention versus those of Muller et al, and believe that the compositions of the invention can be distinguished in the following respects, which are now reflected in the claims as amended.

First, applicants' polymers are individually distinct from Muller et al's polymers. At col 4 line 63 - col 5 line 6, as cited by Examiner, Muller et al say that suitable EO:PO copolymers are block copolymers having 2 - 30% EO, random block copolymers having EO up to 50%, and random copolymers have EO of 10 - 80%. Only the last overlaps with applicants compositions. However, applicants use block copolymers, not random copolymers. See paragraph 0034 beginning at the 4th line: "The block structure can be random or regular." Applicant's polymers, being block copolymers, fall outside of the range in Muller for block or random block polymers. The claims as amended now make this distinction.

Second, applicants have limits in the range of 10 - 30% of PO (propylene oxide) in the polymers, averaged over the composition. This is clear both in the application and in Muller et al. Both applicants and Muller et al use small portions of materials which would be unsuitable for the intended function if they were the majority component.

In applicants' case, these are all-EO molecules, or molecules with PO less than 5%, which do not comport with the description of the entire mixture (e.g., compare paragraphs 0046 - 0047, vs. Examples 3 - 5, containing a minor percentage of pure EO).

In Muller et al, the description of MDI polyisocyanate E (col. 9 line 60 - col 10 line 3) has a high EO (87%) polymer, which would not "qualify" even if it were random (because it is over 80% EO), blended with a low EO polymer to produce an overall composition of 28% EO (72% PO). In those other examples where it is clear, the EO content of the polymers used is about 10%.

Hence, when the average content of EO or PO in the entire formulation is considered, as Muller et al explicitly do at Col 10 lines 1 - 3, it is clear that Applicants range of about 10% to 30% PO (or 90% - 70% EO) is distinct from Muller et al's 2 - 30% EO range. The claims have been amended to refer to the average in the composition, and are thus believed to be distinguishable from Muller.

It noted that the "overall" content limitation is in addition to, and distinct from, the "block" limitation, and each is believed to be sufficient to distinguish the materials under 35 USC 102.

Third, the compositions of Muller have large excesses of "free" (low MW) isocyanates, because the ratios added are large. At Col 6 line 30 ff, Muller et al has NCO:OH ratios, when beginning the synthesis of NCO-tipped polymers, of 3:1 to 20:1. In contrast, applicants have only about 1% to 5% free isocyanate. (NCO/OH ratio of about 1.05:1 or less) at the end of synthesis. There are functional reasons for this large difference, which is needed to provide the particular product. In Muller et al, the excess isocyanate is needed to "blow" the preparation, i.e. to obtain rapid release of carbon dioxide sufficient to produce a low density foam - in his examples, as low as 33 g per cubic meter (Example 6), or about 97% gas by volume. Applicants prefer little or no foam, since they are coating tissues or adhering them together, and hence provide only enough free isocyanate to start the process of reacting with tissue. Because the low NCO:OH ratios of applicant's reactions are unsuitable for producing a blown low-density foam, applicant's compositions are neither obvious over, nor anticipated by, the compositions of Muller et al. A form of this limitation has been in applicant's claims from the beginning, but its significance has apparently not been clear. The claims have been amended where needed to make this distinction clear.

Fourth, applicants deliberately and explicitly do not use catalysts during the manufacture of the isocyanate-capped polyol, nor when polymerizing the reactive polyols with tissue to form a bond or seal or implant or the like. This is done because of the potential of toxic effects of such catalysts on tissue; see paragraph 0040.

While the reference (Muller et al) does not include catalyst in the claims, it uses catalyst in every reaction described (Examples 1 - 7), as is conventional in the art. Claim 1 has been amended to include this distinction, and new claims 49 and 50 make the distinction for independent claims 17 and 40. It is also found in new claim 52.

With this background, and in light of the amended claims, the specific rejections are addressed as follows.

2. Rejection of claims 1 - 3 and 8 under 35 U.S.C. 102(b). The rejection is respectively traversed as applied to the claims as amended. The compositions of the invention are block copolymers, and do not contain purely random copolymers. In addition, the percentages of EO on the average are outside of the ranges described in Muller et al (col. 4 line 67 to col. 5 line 5.) Muller et al col. 7/65 - 8/37, describing preferred compositions, do not extend the compositional range.

Examiner's comments at p. 3 line 2-3 of the office action do not seem to be supported by the cited text. The reference at col. 9 line 46-47 cites a reaction of 750 parts of an "ethylene oxide tipped polypropylene oxide triol" with "250 parts of a 20:80 mixture of 4,4' and 4,2' [isomers of] MDI [methylene diisocyanate]". (bracket clarifications added here.) Based on their composition F (col. 10 lines 4 - 10), "tipping" implies about 10% by weight, and certainly not 75% or 80%. In any case, it is believed that this passage is not a description of the use of 80/20 EP/PO or 25/75 PO/EO.

Hence, the rejection of claims 1-3 and 8 over the reference appears to be not applicable to the claims as amended. Allowance of claims 1 - 3 and 8 as amended is respectfully requested.

Likewise, Examiner's response to Applicant's affidavit is believed to be obviated by looking at the overall ratios of EO:PO, as is now claimed, and the block nature of applicant's polymers. For such polymers, there is a critical limit in applicant's uses (in the range of 30% PO or perhaps more, but less than 50% PO) and in Muller's uses (less than 50% EO). Hence, the areas of the two patents are disjunct - those polymers suitable in Miller et al are not suitable in applicant's uses, and conversely.

3. Rejection of Applicants arguments.

Applicant notes that Muller's range includes only random PO:EO copolymers with up to 80% EO. It is believed that the rejection has been obviated by amending the claims to refer to block copolymers, and to the overall composition rather than to specific polyol components. Both limitations are now found in Claim 1, and claims 2, 3 and 8 depend on claim 1. The rejection under 35 USC 102 is accordingly respectfully traversed.

4. Rejections under 103(a). The remaining previous claims (4 - 7, 9-14, 17 - 30 and 40-48) are rejected under 103(a) as being obvious over Muller et al. It is believed that the rejection is not applicable to the claims as amended.

A. Claims 4 - 7 and 9 - 14. These claims depend on claim 1, as amended, which did not stand rejected under 35 USC 103(a) ("obviousness"). Claim 4 has been cancelled, and its limitations incorporated into claim 1. These claims therefore include by amendment the limitations of "block" and "average" mentioned above.

Muller does not disclose a composition with an average composition in the range of applicants' composition, and applicants' claim compositions comprising block copolymers do not overlap Muller's described average ranges. Moreover, there is no incentive or motivation for applicants to look to Muller, because the blowing of dry, non-adhesive foam compositions is not analogous art to the in-situ formation of hydrogels adhering to human tissue for medical purposes. This is evidenced by the classification of applicant's application compared to that of Muller et al; the classifications (521/xxx for Muller; 606/231 and 404/78.37 for applicants) do not overlap. The information provided in the Affidavit also leads to looking away from high -PO compositions such as Muller et al's. Finally, as noted above, the compositions of Muller et al, and applicants, are disjunct - those suitable for applicants are unsuitable in Muller, and conversely.

The rejection under 35 USC 103(a) for obviousness is respectfully traversed on each of these grounds, as applied to the claims as amended.

Moreover, several of these claims contain further limitations that further distinguish over Muller.

Claim 5 as amended provides an additional polymer (in the composition) with less than 10% propylene oxide units. This is below any range mentioned in Muller (hence not anticipated), and hence there can be no motivation in Mueller et al to use it.

Claim 6 as amended limits the isocyanate to TDI and IPDI, which is distinct from Muller who always uses at least some MDI.

Claims 7 - 10 recite other non-MDI isocyanate compositions. They are further limitations on independent claim 1, and are allowable along with claim 1.

Claim 11 is for a composition with an aromatic isocyanate free in solution and an aliphatic isocyanate tipping the polymer. The reaction rate difference is important in a tissue adhesive but irrelevant in a foam-making process, where there is no need to control the sequence of reaction. In fact, there is nothing analagous in Muller et al; everything is mixed together in a continuous operation. Hence Mueller et al cannot make this procedure obvious. Claims 12 - 14 are further limitations of the same type.

Hence, each of claims 7 - 14 is believed to be allowable.

Claims 17 - 30. Examiner was not specific about the reason for rejection of independent claim 17 or any of its dependents 18 - 30

Independent claim 17 as amended reads in relevant part,

"17. (currently amended) A biocompatible hydrogel-forming adhesive composition comprising at least two branched block polyols wherein at least one of said polyols is a branched polypropylene oxide/polyethylene oxide copolymer, and wherein at least one of said branched polyols consists of a copolymer of less than 10% polypropylene oxide and at least one of said branched polyols comprises a copolymer consisting of between about 10 and 30% polypropylene oxide, both of said copolymers of functionality 1.5-8, said copolymers being terminated with at least one polyisocyanate, said terminated copolymers ~~being in~~ forming a solution, and wherein at least 1% of said solution but not more than 5% of said solution, comprises free polyisocyanate;

characterized in that after polymerization, upon exposure to tissue or water, the adhesive forms a hydrogel comprising greater than 50% water by volume; and

wherein the composition is suitable for use as a biocompatible tissue-bonding adhesive composition.

Muller et al does not describe or enable any alkylene oxide copolymer of less than 10% propylene oxide, nor a composition having a first polyol with less than 10% propylene oxide and another polyol having 10% to 30% propylene oxide, not any block copolymer having less than 50% propylene oxide. Nothing in Muller et al would induce an average artisan to include any of these materials in a polyol composition for making dry foam, and nothing in Muller leads such a person to imagine that such polymers would increase the degree of hydrogel formation or other such purpose. The motivation to combine has not been laid out at al. The rejection is respectfully traversed as applied to the claims as amended.

Claims 18 - 30, being dependent on an allowable base claim, are likewise allowable. Among these claims are elements having no counterpart in Muller et al, such as use of polyols terminated with isocyanates of differing reaction rates (23 - 28), and the elimination of aromatic amines with the less reactive isocyanates (28).

Claim 40 as amended describes a block copolymer having a range outside the Muller et al range. It is thus not anticipated, and is not obvious for the same reasons as cited above. Claim 43 is cancelled, and incorporated into claim 40. Claims 41 - 42 and 44 - 48 are not obvious for the reasons described above for other claims.

New claims 49 and 50 apply the "no catalyst" limitation to claims 17 and 40, should it be required for patentability. As a dependent claim, each claim should be allowable along with the base claim.

New claim 51 is an independent claim combining the "average" and "block" limitations, and adding a tissue reactivity provision, supported in the specification at least in the abstract, and paragraphs 24, 25 and 67.

New claim 52 is an independent claim including the block, gel-forming and isocyanate: hydroxyl ratio limitations, and is believed to be separately allowable over the art of record. .

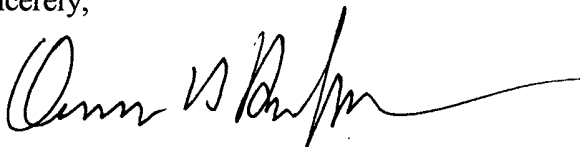
6. Rejection of Declaration: the rejection is believed to be obviated by the amendments to the claims, and previous arguments. (Note that Muller et al discloses a composition of EO content over 50% only in a random copolymer.) It is believed that the % EO range arguments are not applicable to the claims as amended, but if it would facilitate allowance, Applicants are prepared to submit an amended Declaration noting the block nature of the copolymers used. Currently, all the independent claims recite a block copolymer.

7. 112/New Matter rejection. Without conceding that a 70% EO content is not enabled by the specification - we think it is, because the polymer is generally described as a copolymer of EO and PO, and a PO percentage of 30% is frequently mentioned (hence, 70% EO) - we have amended the claims to return to compositions described in terms of the PO content in an EO background. The amended claims are therefore believed to avoid this rejection. We make this amendment as a matter of form, and deny any intent to narrow the scope of the claims.

In summary, it is believed that the claims as amended distinguish over the reference and are not obvious in light of it, and passage of the claims to issue is respectfully requested.

Applicant's representative can usually be reached at 978-790-7186 9 AM - 5 PM, Mon - Fri (please leave message if not connected), or by fax at 978-256-3679, or by e-mail at fckirk@comcast.net.

Sincerely,

A handwritten signature in black ink, appearing to read "Francis H Kirkpatrick", with a long horizontal flourish extending to the right.

Francis H Kirkpatrick (35,219)